Potential Tools and Indicators of Success for Assessing Effectiveness of CALFED Water Quality Actions

Tool	Applicable Parameters of Concern	Strengths	Weaknesses	Current Uses
Water Quality Concentrations/ Objectives	All, except SAR and unknown toxicity.	Objectives and monitoring tests exist for most parameters of concern. Convenient, toxicity-based, nationally accepted values. Can be correlated directly to recreational, drinking water, industrial, and agricultural beneficial use impairments.	Can only be correlated indirectly to environmental beneficial use impairment/improvement.	NPDES permits/ waste discharge requirements. Nonpoint source assessments. TMDLs/waste load allocations. Remedial investigations and risk assessments. Clean-up activities/assessments.
Freshwater Toxicity Test (three species test)	All, except SAR, TOC, and pathogens.	Detects possible environmental beneficial use impairment/improvement. May detect toxicity from unknown causes when chemical tests do not reveal problems. Acute and chronic tests available. Tests using resident species are sometimes possible (e.g., rainbow trout for mountain stream bioassays). Lethal and reproductive effects detected.	Only relevant to possible environmental beneficial use impairment/improvement. Standard tests may not be representative of species affected or field conditions. Typical tests are limited to fathead minnows, zooplankton, and algal assays. Does not detect sub-lethal effects.	NPDES permits/ waste discharge requirements. Nonpoint source assessments. TMDLs/waste load allocations. Remedial investigations and risk assessments. Special studies and region-wide water quality assessments.
Toxicity Identification Evaluation (TIE)	All, except SAR, TOC, and pathogens.	Detects possible environmental beneficial use impairment/improvement. Narrows causes of toxicity to specific substances by using laboratory treatments to test separate fractions of water. Can be used for water column and sediment. Tests using resident species are sometimes possible (e.g., rainbow trout for mountain stream bioassays). May detect toxicity when chemical tests do not reveal problems. Detects lethal and reproductive effects for acute and chronic exposure.	Only relevant to possible environmental beneficial use impairment/improvement. Standard tests may not be representative of species affected or field conditions. Saltwater sediment TIE more developed than freshwater sediment TIE. Does not detect sublethal effects.	NPDES permits/ waste discharge requirements. Nonpoint source assessments. Regional Board assessments of sources of toxicity. Special studies and region-wide water quality assessments.

Tool	Applicable Parameters of Concern	Strengths	Weaknesses	Current Uses
Sediment Quality Concentrations/ Objectives	All, except diazinon, chlorpyrifos, temperature, dissolved oxygen, SAR, TOC, unknown toxicity, ammonia, and pathogens. Sediment absorptive, binding, and flocculating chemicals.	Detects possible environmental beneficial use impairment/improvement. Sediment concentrations act as long-term integrator for chemical loading to the immediate area and from upstream influences. Preserves historical indications of contamination. May detect contaminants not detected by water column tests. Some guidelines developed for the Great Lakes region, British Columbia, and Florida (DWR has compiled a report on these guidelines).	**No Freshwater Sediment Objectives for the Delta or Central Valley.** Indirect measure only relevant to possible environmental beneficial use impairment/improvement. Few other criteria or accepted guidelines for evaluating concentrations. Important to analyze sediment characteristics in addition to parameters of concern. Highly variable spatial distributions. Difficult to estimate exposure to benthic and aquatic organisms. Deposition and resuspension difficult to quantify.	Dredge reuse and disposal assessments. Special studies/baseline characterization. Remedial investigations. Ecological risk assessments. Long-term Management Strategy in Bay-Delta.
Freshwater Sediment Toxicity Test	All, except diazinon, chlorpyrifos, temperature, dissolved oxygen, SAR, TOC, unknown toxicity, ammonia, and pathogens. Sediment absorptive, binding, and flocculating chemicals.	Detects possible environmental beneficial use impairment/improvement. Standard sediment toxicity tests are available (e.g., amphipod, midge, or mayfly tests). Measures reproductive rates and lethal dose levels. May detect toxicity to benthic organisms not detected by water column TIE or water toxicity three species test. Indicates lethal dose for chronic and acute exposure. Detects exposure to bioaccumulative substances.	Indirect measure only relevant to possible environmental beneficial use impairment/improvement. Standard tests may not be representative of species affected or field conditions. Highly variable spatial distributions. Important to analyze sediment characteristics in addition to parameters of concern. Deposition and resuspension difficult to quantify.	Dredging disposal assessments. Special studies. Remedial investigations. Ecological risk assessments.

Tool	Applicable Parameters of Concern	Strengths	Weaknesses	Current Uses
Tissue Concentration (Bioaccumulation and Biomagnification)	All metals and organics.	Directly detects possible environmental and recreational beneficial use impairment/improvement. Provides information on tissue concentrations due to long and short term sub-lethal exposure to resident species. May detect exposure not detected by toxicity tests.	Applicable to limited chemicals of concern. Difficult to differentiate short term vs. long term exposure. Difficult to specify source/s of exposure.	Remedial investigations. Ecological risk assessments. Special studies/baseline characterizations. Human health warnings regarding fish consumption.
Biological Assessment	All, except SAR.	Directly detects environmental beneficial use impairment/improvement. Reveals ecological response to complex stressors to the fish or macroinvertebrate community. Uses native species as indicators of beneficial use impairment. Indicates biodiversity/homogeneity of an area.	Criteria are now being developed and are only applicable to limited types of environments. No baseline data are available for comparison or to aid in interpreting results. Difficult to identify sources and types of stressors. Must be correlated to other information to be meaningful.	Special studies in support of point and nonpoint source investigations. Ecological risk assessments and baseline characterizations.